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<p>(21) International Application Number: PCT/EP89/01499 (22) International Filing Date: 6 December 1989 (06.12.89) (30) Priority data: 9543 A/88 7 December 1988 (07.12.88) IT (71)(72) Applicants and Inventors: NACCI, Gaetano [IT/IT]; NACCI, Carla [IT/IT]; Via delle Fonti, 17, I-50012 Bagno A Ripoli (IT). (74) Agent: GERVASI, Gemma; Notarbartolo & Gervasi S.r.l., Viale Bianca Maria, 33, I-20122 Milano (IT). (81) Designated States: AT (European patent), AU, BE (European patent), BG, BR, CH (European patent), DE (European patent), DK, ES (European patent), FI, FR (European patent), GB (European patent), HU, IT (European patent), JP, KP, KR, LU (European patent), MC, NL (European patent), NO, RO, SE (European patent), SU, US.</p>		<p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: SYRINGE WHICH AUTOMATICALLY MAKES THE HYPODERMIC NEEDLE HARMLESS AFTER USE</p> <div data-bbox="324 1344 1364 1701"></div> <p>(57) Abstract</p> <p>The aim of this invention is of neutralizing the danger of hypodermic syringes and to make them really monouse, according to the invention the needle (a), which shall be referred to as the perforated stiletto, is provided with a female hook (k), and a cylindrical container (m), inserted coaxially in the piston rod (v) of the syringe, is capable of incorporating the perforated needle (a), by means of a male hooking pawl (n), with its support structure (o) and a cylindrical helicoid pull spring (q).</p>		

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SYRINGE WHICH AUTOMATICALLY MAKES THE HYPODERMIC NEEDLE HARMLESS
AFTER USE.

This invention concerns a mechanism incorporated with a piston for
syringes, which automatically renders the hypodermic needle
5 harmless after use, said mechanism neutralizes the danger and
automatically makes the hypodermic syringes equipped with such non-
reusable.

The syringes currently on the market improperly defined as monouse
have but one single weak protection against accidental injury and
10 may be used, in spite of the written warning "use only once" as many
times as desired.

The cap even if inserted is not sufficient protection, since any
accidental cause whatsoever may cause it to come off leaving the
needle exposed and able to injure and even the act of putting it on
15 may itself constitute a potential danger and risk of injury.

Some inventions are known which act on the whole syringe and depend
upon the user and would be designed in such a way as to protect the
needle in a definitive way.

There is one type which, after use, retracts the needle inside the
20 canal by means of the piston, with a maneuver carried out by the
operator; laborious and in any case not automatic. The needle
remains floating inside the canal and cannot injure anyone, as long
as no one removes the piston from the cylinder causing it to emerge.
There are types involving complicated operations which make the

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needle disappear and remain enclosed, however always acting or involving and modifying the whole structure of the syringe.

These systems involve a total revolutionizing and complete restructuring of machinery from the industrial point of view, and
5 from the point of view of the user, complicated use and dubious safety.

The essential aim of this invention is, while leaving unchanged the form and use of the traditional syringe, to give to the industry the facilitated possibility to produce one with only the slightest
10 of added costs and to give to the user the possibility to be able to perform injections as he always has done, with the certainty that his syringe may not accidentally puncture himself or others after use, or that someone else may use it again in any way.

This object is achieved with this industrial invention regarding a
15 syringe formed by a cylindrical body, a piston slidable in said body, a perforated needle, characterized in that said needle is provided with a female hook and in said piston is inserted coaxially a cylindrical container which contains a male hooking pawl with its support structure, operatively connected to a pull helicoidal spring,
20 which is fixed to the same cylindrical container and which is operatively connectable to said female hook to draw back and incorporate said needle in said cylindrical container.

In a preferred embodiment, said syringe comprises a cylindrical container open on both sides, which is inserted coaxially in a
25 housing obtained in the normal rod of said piston and which has a

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rim on its head capable of being housed in a groove of the cap of said piston, said perforated stiletto, or needle, having a female hook, which is slidably supported through a hermetic seal, in a base and which is connected by shearable means to said cylindrical body, 5 a pull helicoid spring extended housed during phase of use inside said cylindrical container and secured at its bottom by a catch and at the other side attached to the support structure of a pawl, which is secured to said cylindrical container by means of at least one pin of shearable material, said pawl with its support structure 10 being inserted, in the phase of use, between the terminal part of said cylindrical container and a canal obtained inside said cap, said canal being closed by a cover of easily perforable material.

The condition of the automatic re-entry of the needle, by means of the pawl, is the last pressure activated pushing the piston against 15 the cylindrical body to completely release the liquid through the same needle. Such operation, which permits that the perforated stiletto, or needle, is incorporated in the syringe, is less dangerous and simpler than that which is carried out by the hygienic agents and user communities, as they now insert the protective cap 20 in order to preserve themselves and others.

As concerns the sad case of drug addicts who use syringes outdoors, throwing them away wherever they might fall, it is unthinkable that they will throw even a single drop of liquid for which they are so desperate and by injecting themselves up to the last drop, they will 25 certainly activate the mechanism which causes the needle to re-

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entry.

Other advantages of this invention lie in the extreme ease of construction and assembly and the extreme slowness of added costs with respect to the normal syringe; maintaining the identical image and use of the traditional syringe; succeeding in guaranteeing that the needle disappear irrevocably after use that the syringe be utilized only one time.

DETAILED DESCRIPTION OF THE INVENTION

These advantages and innovative and functional features will be further and understood by every technician of the field by the description which follows and with the aid of the attached illustrations of fig. 1 to 9, as a practical example, but not hardly limited.

- In fig. 1 to 5 are shown some components of the syringe according to the invention;
- in fig. 6 is shown the syringe ready for use;
- in fig. 7 is shown the syringe with the needle drawn back;
- Figure 8 represents an enlarged detail with the perforated needle in use and the piston almost at the end of its stroke.
- Figure 9 represents the moment of hooking between the pawl and the perforated needle.

In the figures the letter (a) represents the perforated stiletto, or needle and (k) the female hook; (c) represents the base of the perforated stiletto, (b) is the neck of the syringe and (d) is the hermetically sealed gasket, as best shown in fig.8; (w) is a

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membrane of suitable plastic material which fixes the needle (a) to the cylindrical body (u) and is shearable with a predetermined pull force.

The letter (e) represents the cap of the piston rod (v) with the easily perforable cover (f) on the cap head at the center; the cap (e) is in especially resilient (springy) material; (g) is the hole or canal to house the hooking pawl (n); (h) is the groove to insert the rim (i) of the cylindrical container (m).

The cylindrical container (m) is long enough so as to be inserted in the piston rod (v) and to emerge so as to be able to be inserted stably by means of the rim (i) in the groove (h) of the cap (e); the cylindrical container (m) will have in its walls two holes to house the two pins (l) in easily shearable material, inserted in special notches (p) of the support structure (o) to fix it to the same container (m).

The letter (n) represents the male hooking pawl integral with the support structure (o); (q) is the helicoid pull spring attached to the support structure (o) of the pawl (n) and to the catch (r).

Some catches (z, x) are placed inside the base (c) and outside the neck (b) of cylindrical body (u), as shown in fig. 2, and are capable of maintaining the same base (c) stable and of keeping the needle (a) and its hook (k) at the right distance.

The pawl (n) will be capable of emerging (being discharged) in the center of the cap, lacerating the thin layer of watertight but perforable material (f) covering the hole (g) suitable for exposing

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it with the last pressure placed on the piston rod (v), thanks to the resilience or elasticity of the head (e) of the cap, so as to discharge all the liquid and at the same time hooking itself, permanently in the hollow protuberance (k) of the perforated
5 stiletto or needle (a).

When the plastic membrane (w) is broken, perforated metallic stiletto, or needle, (a) can slide in its base (c) and in the watertight seal gasket (d) joined or soldered to the base (c) and inserted inside the neck (b) of the hypodermic syringe.

10 This last above-mentioned pressure will cause the pins to cut the perforable material (1) inserted to jointly hold the cylindrical container (m) with the support casing (o) of the hooking pawl (n) attached to the helicoidal spring (q) in tension, since it is held at the opposite end of the catch (r) to the cylindrical container
15 (m).

The spring (q), once released, while breaking the plastic membrane (w), will close drawing up inside the cylindrical container (m) the support casing (o) of the hooking pawl (n) which at the same time will be inserted in the hollow part (k) of the perforated stiletto
20 (a) consequentially pulling also itself inside the cylindrical container (m) and leaving it permanently harmless and non-reusable.

In practice, the details of execution may in any case vary in equivalent manner; in form, arrangement or order of the sections or elements, nature of materials used, without however leaving the
25 innovative concept adopted and therefore keeping within the limits of the protection granted for this patent for an industrial invention;

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CLAIMS

1 1. Syringe which automatically renders the hypodermic needle
2 harmless, formed by a cylindrical body (u), a piston (v) slidable in
3 said body, a perforated needle, or stiletto (a), characterized in
4 that said needle (a) is provided with a female hook (k) and in said
5 piston (v) is inserted coaxially a cylindrical container (m), which
6 contains a male hooking pawl (n) with its support structure (o),
7 operatively connected to a pull helicoidal spring (p), which is
8 fixed to the same cylindrical container (m), and which is
9 operatively connectable to said female hook (k) to draw back and
10 incorporate said needle (a) in said cylindrical container (m).

1 2. Syringe according to claim 1, characterized in that it comprises
2 said cylindrical container (m) open on both sides, which is inserted
3 coaxially in a housing obtained in the normal rod of said piston
4 (v), and which has a rim (i) on its head capable of being housed in
5 a groove (h) of the cap (e) of said piston (v), said perforated
6 needle, or stiletto (a), having a female hook (k), which is slidably
7 supported, through a hermetic seal (d) in a base (c) and which is
8 connected by shearable means (w) to said cylindrical body (u), said
9 pull helicoidal spring (q) extended housed during phase of use
10 inside said cylindrical container (m) and secured to its bottom by a
11 catch (r) and at the other side attached to the support structure
12 (o) of said pawl (n), which is secured to said cylindrical container
13 (m) by means of at least one pin (l) of shearable material, said
14 pawl (n) with its support structure (o) being inserted, in the

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15 phase of use, between the terminal part of said cylindrical
16 container (m) and a canal (g) obtained inside said cap (e), said
17 canal (g) being closed by a cover (f) of easily perforated material.

1 3. Syringe according to the claim 2, characterized in that said cap
2 (e) in its head is extremely resilient and pushing the piston (v)
3 against the top wall of body (u), it will hide, allowing the pawl
4 (n) to perforate said easily perforable cover (f) and going on to
5 hook (k) itself, emerging, to the female of the perforated needle
6 (a).

1 4. Syringe according to the claim 2, characterized in that the base
2 of said perforated needle comprises a hermetically sealed gasket (d)
3 which however allows the sliding of the same needle, when it is
4 drawn back.

1 5. Syringe according to the claim 2, characterized in that said at
2 least one perforable pin (l), is inserted along the cylindrical
3 container (m) in a respective notch (p) of said support structure
4 (o) of the pawl (n), such pin (l), shorn by the last pressure acting
5 on the piston rod, makes sure that the perforated needle (a) is
6 drawn back and incorporated into the cylindrical container (m)
7 together with the pawl (n), its support structure (o) and the
8 spring (q) contracted.

TAV.1

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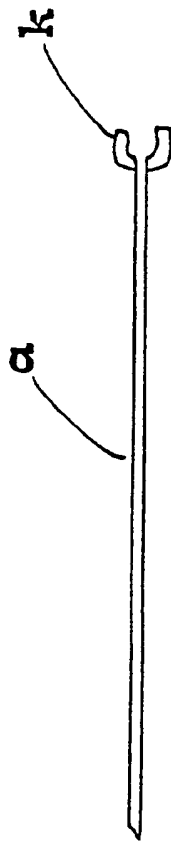


FIG. 1

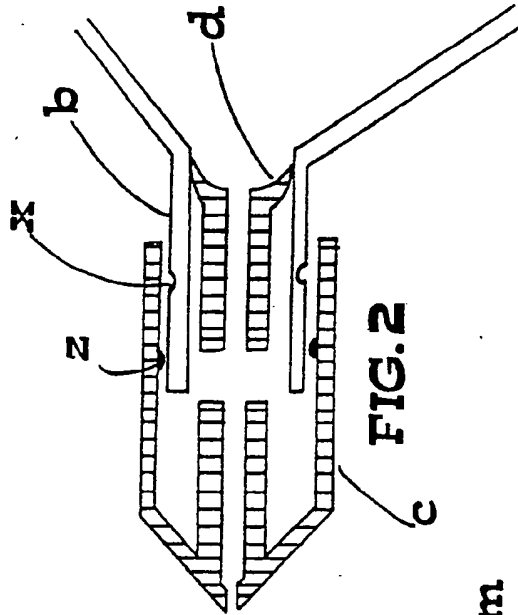


FIG. 2

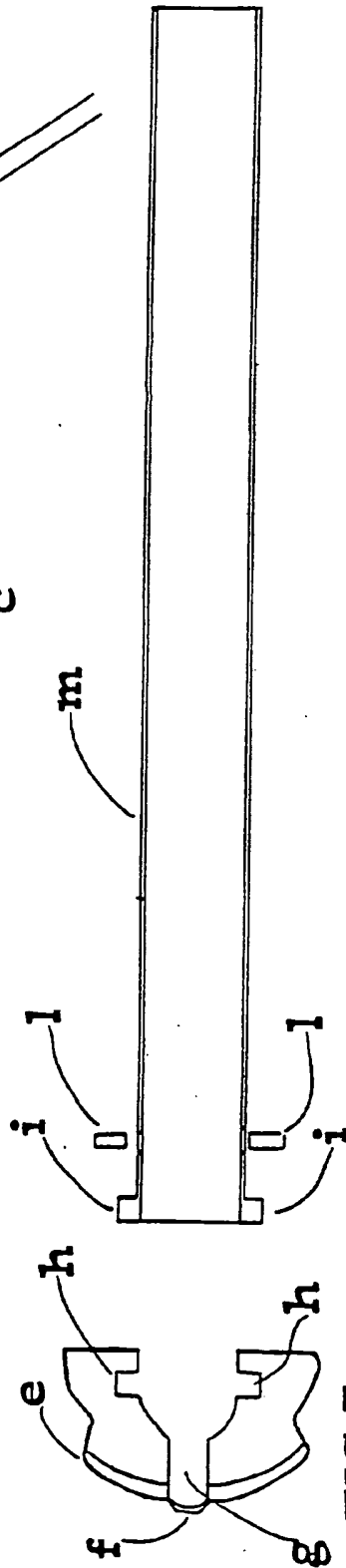


FIG. 3

FIG. 4

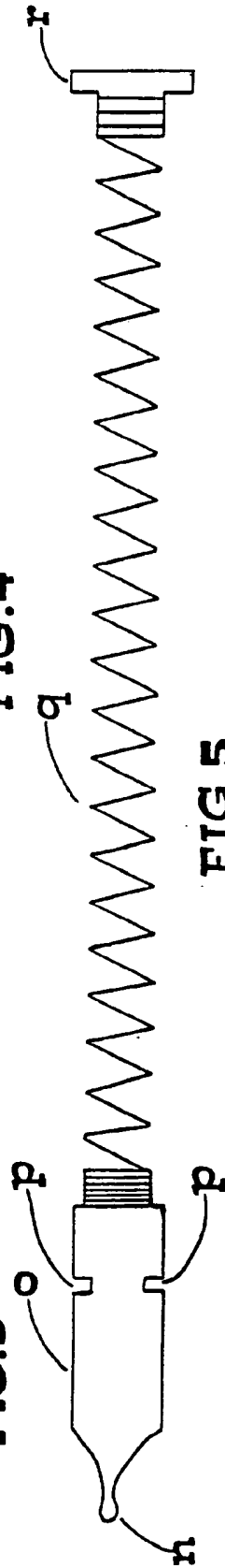
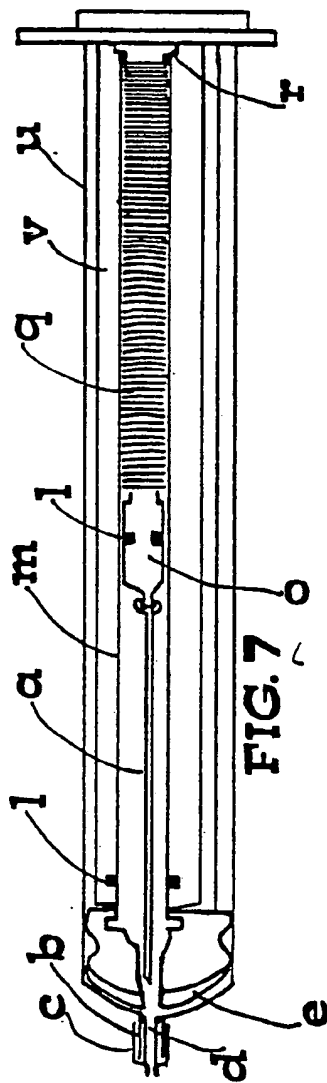
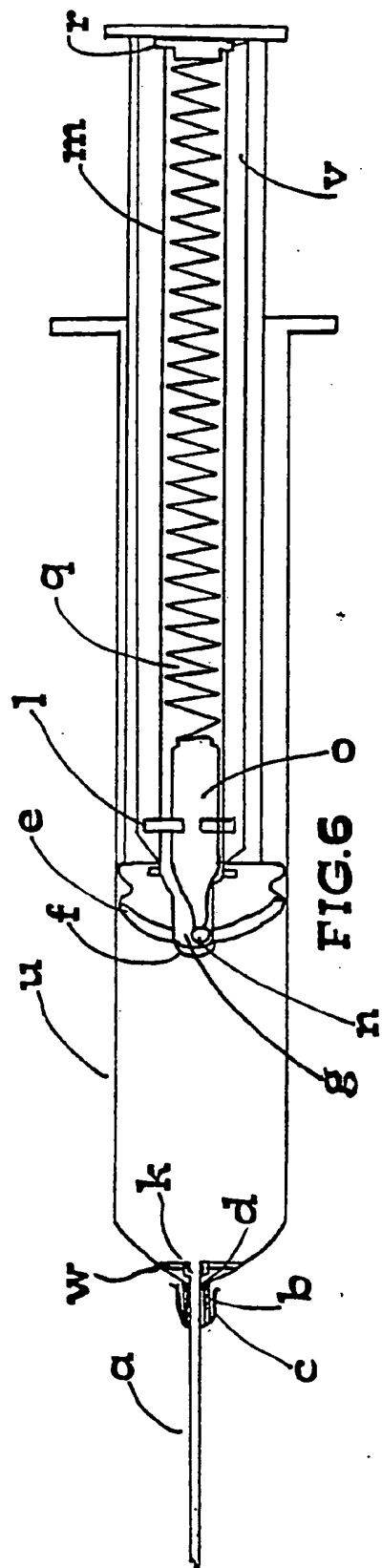


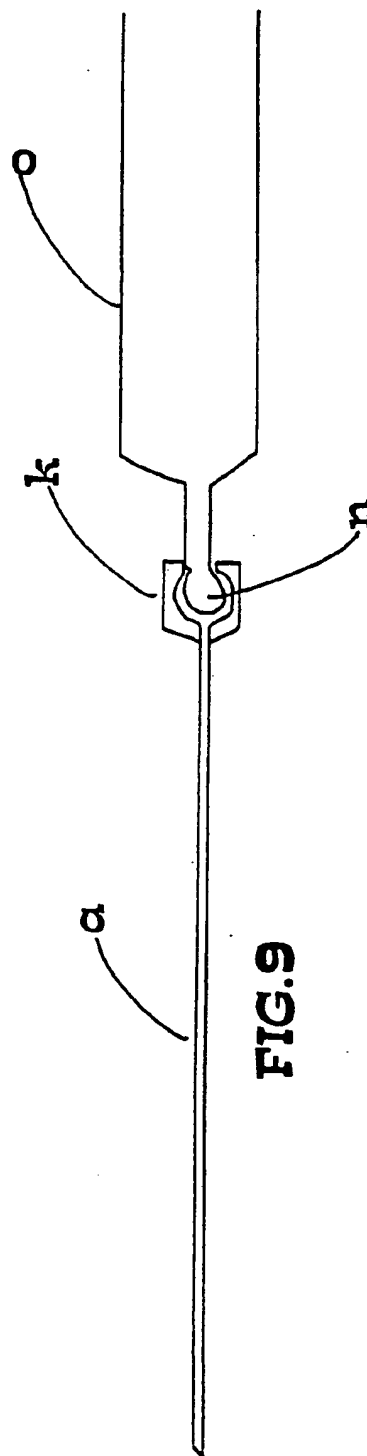
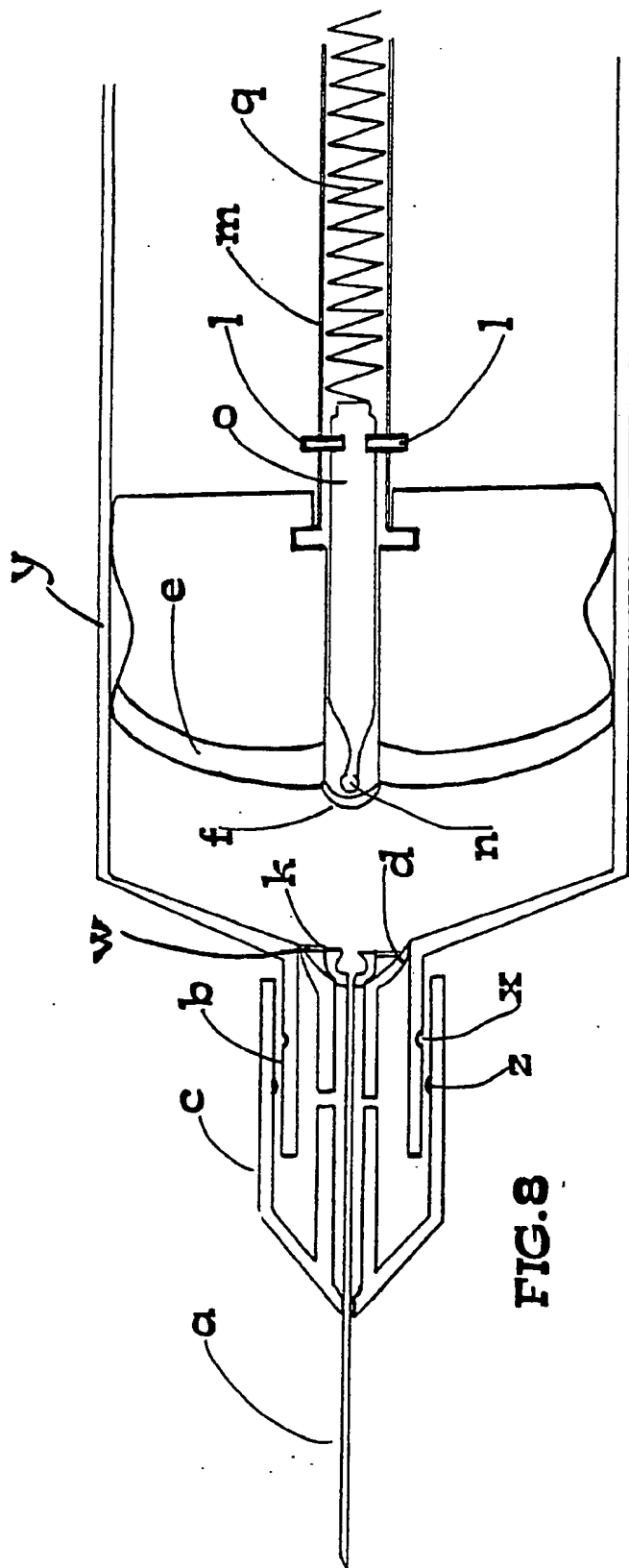
FIG. 5

TAV. 2



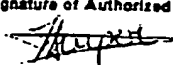
TAV. 3

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INTERNATIONAL SEARCH REPORT

International Application No. PCT/EP 89/01499

I. CLASSIFICATION OF SUBJECT MATTER : several classification symbols are indicated and : According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁵ : A 61 M 5/32		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC ⁵ A 61 M		
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
III. DOCUMENTS CONSIDERED TO BE RELEVANT*		
Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages **	Relevant to Claim No. **
P,Y	WO, A, 8900435 (GAARDE) 26 January 1989 see abstract, page 2, line 16 - page 3, line 31; claims 1-4, figures 1-3 --	1-4
P,Y	WO, A, 8909075 (DAVSA SEVENTY-FIFTH PTY LTD) 5 October 1989 see abstract, page 6, line 34 - page 7, line 30; figures 1-4 --	1-4
A	US, A, 4747831 (KULLI) 31 May 1988 see abstract, column 14, line 65 - column 15, line 40; figures 4-6,14 -- ./.	1
* Special categories of cited documents: ** "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date of priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such docu- ments, such combination being obvious to a person skilled in the art "A" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
6th April 1990	04 MAY 1990	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE		
Mme N. KUIPER		

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4747830 (GLOYER et al.) 31 May 1988 see abstract, column 7, line 34 - column 8, line 9; figures 13-23 --	1
A	EP, A, 0282097 (HABLEY MEDICAL TECHNOLOGY CORPORATION) 14 September 1988 see abstract, figures 1-5 -----	1

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

EP 8901499

SA 33008

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 25/04/90. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A- 8900435	26-01-89	None	
WO-A- 8909075	05-10-89	None	
US-A- 4747831	31-05-88	AU-A- 1536688	03-11-88
		EP-A- 0290176	09-11-88
US-A- 4747830	31-05-88	None	
EP-A- 0282097	14-09-88	US-A- 4826484	02-05-89
		US-A- 4770655	13-09-88
		AU-A- 1308888	22-09-88
		US-A- 4804370	14-02-89